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ABSTRACT

This packet an autoinstructional program for secondary school chemistry students is presented. No prerequisites are suggested. It can be used with high, medium or low level achievers. The behavioral objective is presented directed towards the students' achievement in listing observations made. Equipment and materials needed are listed. A bibliography, instructions, the suggested experiment and a corresponding optional experiment are included in the lesson. (EB)

OBSERVATION

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June 30, 1973

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A-T TEACHER'S GUIDE

Packet Number - AT 540.018
S

Subject - Chemistry

Title - Observation - Chemistry

Prerequisites - None

Grade - 11

Level - H M L

Behavioral Objectives - To list observations made on a seemingly simple system - a candle.

Equipment and Material - Tape Recorder
Tape - "Observation"
Box containing materials
Envelope I - Copy of Experiment I
Envelope II- Supplies and Equipment
1 candle
1 ruler
1 3x5 card
1 box of matches
Envelope III- Copies of Optional Exp.

Space Required - Carrel

Bibliography -

Bassow, Herbert. Observation and Interpretation in Chemistry. New York: College Entrance Book Company, 1971, Page 3.

O'Connor, Paul R., and others. Chemistry: Experiments and Principles. Raytheon Education Company, 1968.

Parry, Robert W., and others. Chemistry: Experimental Foundations. New Jersey: Prentice-Hall, Inc. 1970.

Tellefsen, Robert L., and others. Laboratory Manual Chemistry: Experimental Foundations. New Jersey: Prentice-Hall, Inc., 1970, Page 1.

Evaluation - Evaluation of listed observations

OBSERVATION

What is the nature of science? What is the nature of chemistry?

We shall develop the answers to these questions not through words alone, but through experience. It is impossible to convey through words the excitement of scientific discovery. We shall see the nature of science by engaging in scientific activity. We shall see the nature of chemistry by considering the problems which interest chemists.

Our starting point will be an introduction to the activities of science. An understanding of the activities of science is of utmost importance since it is these activities that you will be involved in for the entire course. We will perform these activities beginning on familiar ground. On such ground where you know the answer, you will best see the steps by which science advances.

What are these activities of science? One is the accumulation of information by observation. Another is the organization of information and the seeking of regularities. A third activity is wondering why regularities exist. And finally, there is the communication of our findings to others.

Let's begin by learning to make careful observation. Observation is most useful when conditions which affect the observation are carefully controlled. A condition is controlled when it is fixed, known, and can be varied deliberately. An observation brought under control is called an experiment. All science is built upon the results of experiments.

PAUSE

You should now locate closet A. It is to the left of the three fume hoods across the room. There you will find a box labeled AT-1. Bring the box to the carrel. OFF In the box you should find three envelopes labeled I, II, and III. In envelope I is a copy of your first experiment. Read the entire experiment. OFF

You now know that your first experiment involves making careful observation. This may seem exceedingly simple but there are two problems that sometimes arise. The first one involves distinguishing between an observation and an interpretation. Remember, an observation is a record of what is observed, while an interpretation adds significance and implication. Lets look at some examples that

illustrate the difference. The following is a list of three statements. See if you can decide which is an interpretation and which is an observation.

Statement one: Jim and Jane are brother and sister.
Statement two: Jim and Jane are going steady.
Statement three: Jim and Jane are frequently seen together.

PAUSE

If you said that the first two were interpretations and the third was an observation, you were right. Seeing two people together tells nothing of their relationship. Here is another set of three statements. Try your luck again.

Statement one: A man is sitting in a blue Chevy in the east parking lot.
Statement two: A man is sitting in his blue Chevy in the east parking lot.
Statement three: A man is sitting in his friend's blue Chevy in the east parking lot.

PAUSE

In this example the first statement is an observation. The second and third are interpretations. Seeing a man in a car tells nothing about the ownership of the car.

In experiment one, you must make observations only.

The second problem that sometimes arises with the experiment involves the student attempting to describe more than the candle. For example, the color of the walls of the lab is not important. Remember to describe only the candle.

PAUSE

Remove the materials from envelope II and begin the experiment. You can take as much time as you need but you should try to finish about five minutes before the end of the period. OFF.

Now that you have completed the experiment place all of the materials back into envelope II.

PAUSE

Put the copy of the experiment into envelope I.

PAUSE

In envelope III there are several copies of experiment Ia. This is an optional experiment that can be performed at home. If you wish to do this experiment take a copy of the experiment home with you. The lab write-up for both experiments should be turned in tomorrow.

PAUSE

Place the three envelopes in the box and return the box to the closet where you found it. When you return, please rewind the tape.

Thank you.

EXPERIMENT I - SCIENTIFIC OBSERVATION AND DESCRIPTION

Everyone thinks of himself as a good observer. Yet there is much more to observation than meets the eye. It takes concentration, alertness to detail, ingenuity and often just plain patience. It even takes practice! Try it yourself. See how complete a description you can write about a familiar object, - say, a burning candle. Be scientific about this and start with an experiment. This means you should observe the burning candle in a laboratory, because it is a place where conditions can be controlled.

But how do we know what conditions should be controlled? Be ready for surprises here. Sometimes the important conditions are difficult to discover but an experiment can be meaningless unless the "conditions that matter" are controlled. Here are some conditions that might be important in "some" experiments but are not important here:

(1) The experiment is done on the second floor.
(2) The experiment is done in the daytime.
(3) The room lights are on.

Here are some conditions that might be important in your experiment:

(1) The lab bench is near the door.
(2) The windows are open.
(3) You are standing close enough to the candle to breathe on it.

Why is the second set of conditions important? They relate to a common factor: a candle does not burn well in a draft. Important conditions are often not as easily recognized as these. A good experimentalist pays much attention to the discovery and control of conditions that are important.

Procedure

First examine the candle carefully. Then place it on the 3" x 5" card, light it, and record as many observations as you can. Do not write these observations in paragraph form. Simply list the observations.

When you are finished reading, turn on the tape recorder.

OPTIONAL EXPERIMENT I - FURTHER OBSERVATIONS OF A CANDLE

The activities of science that we are considering are obviously not limited to the classroom. In this experiment which you will do at home, you will continue the study of burning candles and get more practice in making observations.

Supplies: Soup bowl; tall drinking glass; two birthday candles; matches; tapwater.

1. Note the amount of wax present in one of your wax candles, then light it and allow it to burn completely down. Compare the amount of wax remaining to the amount originally present.

2. Warm the base of a candle with a match then press it quickly in the middle of a soup bowl so that it sticks firmly and stands upright. Light the candle, and when it is burning brightly, cover it with a tall drinking glass (Figure 1) What happens to the flame?

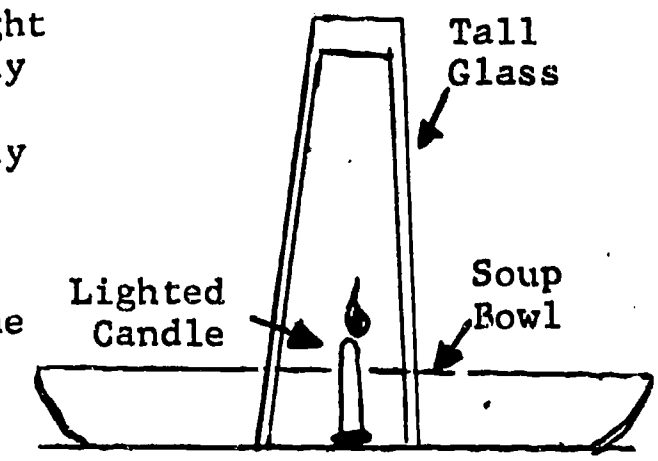

Figure 1

3. Remove the glass and fill the soup bowl three quarters full of tap water. Relight the candle and once more carefully lower the glass over it until the rim is almost touching the bottom of the bowl. (Figure 2) Hold the glass carefully in this position until no further changes occur. What happens to the flame? What happens to the water inside the glass?

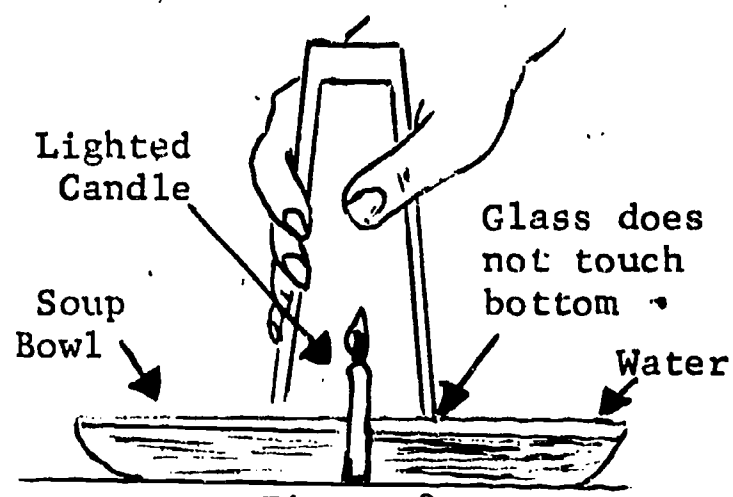

Figure 2